IMPELLER AND METHOD OF MANUFACTURING SAME

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

This invention relates to impellers for centrifugal pumps and more specifically to a pump impeller that is constructed to be in precise alignment and the method of manufacturing same.

DESCRIPTION OF THE RELATED ART

A well known impeller for centrifugal pumps uses a series of radially extending vanes. Rotation of the impeller causes liquid which is being supplied to the center area of the impeller to be radially accelerated and dispensed from the periphery of the impeller. A typical pump impeller is essentially composed of three parts. These parts are hub, vanes and shroud. In the past, the typical way to manufacture such an impeller is to mold the vanes, mold the shroud, mold the hub and then physically connect the parts together by some means, such as welding or adhesive. A strong attempt is made to align the longitudinal axis of the shroud with the axis of rotation of the motor drive shaft. However, normal misalignment up to .060 inches is common. An additional manufacturing step is required of machining the annular

inlet ring which is integral to the shroud to correct this misalignment. The shroud frequently turns slightly during the adhesion to the vanes which produces the misalignment.

The motor drive shaft, which is used to rotate the impeller, is connected to the hub. Therefore, the hub rotates about the axis of rotation. The shroud has an inlet opening through which liquid is to be supplied within the impeller. Surrounding the inlet opening is the annular inlet ring. If the longitudinal center axis of the annular inlet ring is not precisely aligned with the axis of rotation of the hub, there will inherently be caused a wobble. The wobble produces an undesirable vibration and noise. The wobble also accentuates premature failure and wear during operation of the pump. The wobble also causes inefficient operation of the pump. These disadvantages have been found to be most undesirable especially in using of a pump in conjunction with swimming pools or spas.

It would be most desirable to design a pump impeller where the axis of rotation of the hub is always precisely aligned with the longitudinal center axis of the inlet opening thereby eliminating undesirable vibration, noise and increasing pump efficiency.

SUMMARY OF THE INVENTION

The first basic embodiment of the present invention

relates to a method of manufacturing a pump impeller by forming in a single molding operation the shroud, vanes and shaft sleeve to obtain alignment of the axis of rotation of the sleeve with the longitudinal center axis of an annular inlet ring mounted on the shroud.

A second basic embodiment of the present invention relates to a pump impeller which utilizes a series of vanes to which is integrally attached a shroud with the shroud having a centrally located annular inlet ring through which is an inlet opening which provides access to the eye of the impeller. A hub is integrally connected to the inner end of the vanes with the hub having a sleeve integrally connected thereto. The sleeve has an axis of rotation and the inlet opening has a longitudinal center axis. Both of these axes are in alignment.

A further embodiment of the present invention is where a cover is to be mounted about the hub in direct contact and attached to the vanes.

A further embodiment of the present invention is where there is a sleeve mounted on the hub.

A still further embodiment of the present invention is where the sleeve is at least one inch in length.

A further embodiment of the present invention is where the second basic embodiment has defined the inlet opening of the annular inlet ring to be of a size larger than the hub which facilitates its manufacture.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference is to be made to the accompanying drawings. It is to be understood that the present invention is not limited to the precise arrangement shown in the drawings.

Figure 1 is a side elevational view of the pump impeller of the present invention;

Figure 2 is an end view of the pump impeller of the present invention taken along line 2-2 of Figure 1;

Figure 3 is a cross-sectional view through the pump impeller of the present invention taken along line 3-3 of Figure 1; and

Figure 4 is a longitudinal view, partly in cross-section, through the pump impeller of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring particularly to the drawings, there is shown a pump 10 which has a pump housing 12. The pump housing 12 is designed to be connected to a motor housing 13. The motor housing 13 is to include an electrically operated motor which when operated will cause rotation of a motor shaft 14. The free outer end of the motor shaft 14 includes a series of threads 16. The motor shaft 14 includes an axis of rotation 18.

The housing 12 has an internal chamber 20 and inlet conduit 30. A discharge conduit 28 has an internal passage 31 which connects to internal chamber 20. Pump impeller 34 is rotatably mounted within internal chamber 20. The internal chamber 20 also connects with inlet conduit 30 which has an internal passage 29. Surrounding the inlet conduit 30 and formed within the internal chamber 20 is an annular groove 32.

The pump impeller 34 has a shroud 36 which is basically disc-shaped. The shroud 36 includes an annular inlet ring 38. The annular inlet ring 38 is centrally formed within the shroud 36 so that in essence the shroud 36 is the shape of a ring. The annular inlet ring 38 is rotatably mounted within the annular groove 32. Annular inlet ring 38 has an inlet opening 40. Mounted on the inside surface of the shroud 36 are a plurality of vanes 42. Each vane 42 is defined as being arcuate and extend from a hub 44 to the peripheral edge 35 of shroud 36. The arrangement of the vanes 42 is deemed to be a matter of choice with a typical arrangement being where the vanes 42 are basically all of the same length and of the same curvature, as shown in the drawings. However, the length of the vanes 42 and their pattern of arrangement and configuration could be altered without departing from the scope of this invention. There is shown eight in number of the vanes 42. Also, the number of the vanes 42 could be increased or decreased without departing from the scope of this invention.

It is to be noted that the diameter of the hub 44 is

smaller than the diameter of the inlet opening 40. This is required so that the entire pump impeller 34 of this invention can be manufactured in one single unit except for the cover 46. Cover 46 comprises a disc and is designed to be placed about the hub 44 and to be welded or otherwise secured to the vanes 42. Thus, in essence, the use of the cover 46 and the shroud 36 form an enclosing chamber 37 that will permit the liquid only to escape from the peripheral edge 35 of the pump impeller 34. Liquid is to be conducted through passage 29 of the inlet conduit 30 and to be deposited within the eye 48 of the pump impeller 34. Located in conjunction within the confines of the eye 48 is a mound 50 that is to function to assist in changing the flow of the liquid from an axial direction to a radial direction and direct the flow outwardly to the peripheral edge 35 of the pump impeller 34.

The motor shaft 14 is fixedly attached to the pump impeller 34 by means of threads 16 which engage with an appropriate series of threads mounted within the interior of a shaft sleeve 52 which is integral with mound 50. The axis of rotation 18 is to be in precise alignment with the longitudinal center axis 54 of the annular inlet ring 38 and the inlet opening 40. The shaft sleeve 52 will preferably be about one inch in length with the inside diameter precisely fitting the shaft 14, for precise alignment. For strength purposes in the attachment of the shaft sleeve 52 to the hub 44, there is formed a hub collar 56.

Pump impeller 34, is rotated by rotating of shaft 14

within shaft receiving opening 15 found in motor housing 13. Rotating pump impeller 34 causes liquid to be drwn from passage 29 into enclosing chamber 37, propelled radially outwardly past peripheral edge 35 through vane openings 33 (eight in number) into discharge passage 31 of discharge conduit 28. Because the pump impeller 34 is not formed of several parts but is formed of one part from the shaft sleeve 52 to the annular inlet ring 38 of the shroud 36, the axis of rotation 18 will be precisely aligned (within .006 inches) with the longitudinal center axis 54 preventing any kind of a wobble which is common when constructing of the pump impeller 34 of a multitude of parts which are welded together inherently creating a misalignment between the axes 18 and 54. The maximum misalignment of .006 inches is totally acceptable.